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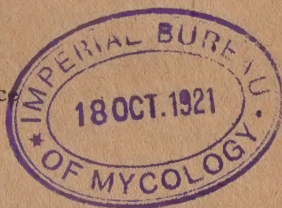
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DEPARTMENT OF AGRICULTURE.

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EDITORIAL NOTES—MAY, 1920.

The Transport of Cattle Ordinance 1920, which was passed during the recent session of the Legislative Council, gives the Governor in Council power to make regulations controlling the embarkation and disembarkation of cattle transported by water within the Colony, the treatment of cattle while being so transported, and the export of cattle from the Colony. In the schedule to the Ordinance are certain regulations dealing with these matters which provide that a minimum space of 2 ft. 6 in. wide must be provided for each animal; that for journeys exceeding 12 hours, 5 gallons of fresh water must be provided for each animal with the proper arrangements for watering the animals; and that proper ventilation and foothold must be provided. No cows or heifers may be exported from the Colony without the written permission of the Superintendent of Agriculture, and all cattle intended for export must be inspected by an Inspector of Stock, and none may be exported which an Inspector shall certify in writing to be diseased.

The sum of £2,350 was voted in the Legislative Council on 8th May for the purpose of acquiring the lease of Navuso Estate, near Naduruloulou, for rice growing. This land is the first of three blocks to be acquired under a scheme for making the Colony independent upon outside supplies of rice. Particulars of the scheme will be published later on. A note upon the mechanical cultivation of rice will be found elsewhere in this number.

The Report of the Special Committee appointed to consider proposals for settling Returned Sailors and Soldiers on the land was presented to the Legislative Council during the recent Session. The scheme recommended by the Committee is the establishment of Dairy Farms with a Butter and Bacon Factory in the Tailevu district. His Excellency the Governor has appointed the members of the Special Committee to be a Committee to consider and advise the Government upon certain outside questions and criticisms which have arisen regarding this scheme.

A report upon, and valuation, of the shipment of cotton referred to in these notes in the April number of this Circular have been received from the British Cotton Growing Association, Manchester, to the following effect:—

<i>Quantity.</i>	<i>Description.</i>	<i>Value.</i>	<i>Classification.</i>
3 bales		92d.	Creamy in colour;
D A		to	staple fine and long;
F	Fiji	97d.	fairly strong.
110/112			

An Ordinance was passed at the recent session of the Legislation providing for the collection of agricultural and pastoral statistics. The figures published annually in the Blue Book have been compiled hitherto from returns sent in voluntarily by planters. Statistics collected under such conditions are liable to serious inaccuracies, such for instance as a crop of 29,687 tons of rice from 13,508 acres in 1913. When returns under the new law are obtained, the progress or otherwise of the agricultural and pastoral industries of the Colony can be exactly determined.

Other legislation affecting the planting industries passed at the session of the Legislative Council previously referred to, places an additional export duty of 10s. per ton on copra and 10s. per ton on sugar.

The Government Veterinary Officer suggests that careful attention should be paid in the case of horses or mules to minor injuries in order to prevent losses from blood-poisoning and surgical deformities, and loss of working time during long-drawn-out convalescence. Animals should not be worked with bad sore shoulders or severe lameness. A farrier's knife or "searcher" should be available in every stable to pare out injured feet and to release the pus which has accumulated under the horn as the result of picked-up nail or stone bruise. The following fly-preventing wound dressing should be available in each stable and its use compulsory:—Camphor, $\frac{1}{2}$ ounce; creosote, 2 drachms; turpentine, 2 ounces; coconut oil, 10 ounces; shake well and apply with a *clean* feather.

MECHANICAL CULTIVATION OF RICE.

The *Agricultural News* (Barbados) of January, 1914, quotes an abstract from the *Monthly Bulletin of Intelligence and Plant Disease* for August, 1913, on the mechanical cultivation of rice.

The note states that the experiments on which the information was based were conducted by the Indo-Chinese Rice Growing Association. Seed was sown by a small hand-sower, which proved to be a superior method to the transplanting system of the native cultivator. By means of the hand-sower, 0.6 acres can be sown a day, the rice being distributed in small holes in rows 12 in. to 16 in. apart and 14 in. apart in the rows. The superiority of the hand-sown grain was soon demonstrated, though the necessity for sowing on clean land became evident as hoeing was a difficult process on the submerged soil. The *sown* crop came into ear earlier and gave better promise of yield than that planted in the native style. The crop was harvested in two different ways. A reaper and binder was used in one case, the other method being apparently to harvest by hand. The largest yield, namely, 1 ton 16½ cwt. per acre was obtained in the case of the rice *sown* on ploughed land as against 1 ton 3½ cwt. of rice *transplanted* on ploughed land.

EXTRACTS FROM REPORTS OF INSPECTORS.

COCONUT SCALE (*Aspidiotus* species).

Mr. M. A. Forsyth, Levuka, reports several visits of inspection have been paid to Bureta, Waidau and various towns between Levuka and these places. At one town only, Visoto, outside of Bureta district, was scale found, and there it was not extensive. The trees affected were dealt with satisfactorily between two visits. Bureta is still badly affected, but improving, and there appears to be no spread of the scale on Ovalau. Arrangements have been made for conducting spraying experiments upon the attacked trees at Bureta.

Waidau and Viro are both showing much improvement. Scale was found on the weed kaumoce, which is common at Bureta.

At Moturiki a number of badly attacked trees, where they were growing too closely together have been felled, but more felling is desirable.

Heavy rains through the month have interfered with the work to some extent.

A special visit was paid to Savusavu Bay and the coconuts for a few miles along the coast around Nakama were inspected. No sign of coconut scale was found and the coconut palms look very healthy indeed.

Scale is reported from certain of the Yasawa islands.

IMPORTATION OF PLANTS.

The Inspector of Produce reports that 37 cases of apples were destroyed, being badly affected with Codlin moth, brown spot and scale.

INSPECTION OF PLANTATIONS.

The Inspector of Produce reports that he proceeded to Sigatoka to inspect banana plantations and to enquire into the condition of the plants as to freedom from the disease which has prevented shipments from that district

being made during the last six years.. Owing to heavy rains it was only possible to go 10 miles up the river. Most of the plantations in this area were seen and they were mostly in a flourishing condition. The China bananas appear to have recovered from the disease and show practically no trace of it. The Gros Michels are steadily improving and it should not be long before they too have rid themselves entirely of disease.

Fairly large areas have been planted and shipments on a large scale should be coming forward before the end of the year.

A few small plots of Cuban Red bananas were noticed. Some of the bunches were very fine for this variety. When ripe the appearance of this banana is very attractive and the flavour is exceptionally good. It is understood that a few cases would be shipped shortly to test the market.

The banana scale was very thick on some plants and the scale is evidently in the active process of reproduction in this district.

Sisal hemp.—Two plantations were visited where sisal hemp is being cultivated. At both places the plants looked remarkably well and most old plants are bearing leaves measuring 8 feet in length. The situation of these cultivations, on the lower slopes of the hill-sides, seems to be entirely suitable for sisal hemp.

Maize.—The maize crop at Sigatoka should be a record one. Large areas have been planted up and as high prices are being realised (in New Zealand (a recent shipment realised 8s. 11d. per bushel) there has been considerable inducement to grow maize, and it should be remembered by exporters, or would-be exporters, that only first-class maize should be exported.

Yams.—The drought last year killed off the yam crop of the natives, which usually is an important part of the native food supply in this district.

Rice.—The rice crop, so far as area goes, appears to be the record one, and given satisfactory weather there should be some surplus paddy.

The Inspector of Produce reports on a visit to Rewa as below to enquire into the reasons for a certain falling off in the quality of some of the bananas offered for export.

The banana borer appears to be extremely plentiful, no stools examined having been found to be free from the pest. Attacks of a leaf disease, similar in appearance to that which has been referred to as the "Sigatoka disease" were very common. The plant appears to be healthy at first and continues so until it throws a bunch, when the leaves begin to die one by one, until eventually there is little or no protection left for the fruit, and this ripens before it is properly matured. The "cabbage" disease is also plentiful, and in all cases examined the bulbs in attacked stools were also attacked by the borer. The shortage of labour is being acutely felt by the planters in this district. Scale was somewhat plentiful, and from the numerous colonies of young insects seen it would appear to be actually spreading.

INSPECTION OF FRUIT.

The "Atua" replaces the "Navua" for fruit carrying to New Zealand this trip.

Owing to the steamer running late, loading did not commence until 11 a.m. on Saturday, 15th May, instead of the advertised time—8 a.m. on the 14th. To expedite loading, shippers placed fruit on the King's wharf, where it was inspected for subsequent loading, some 9,000 cases being so dealt with.

This arrangement, which was agreed to in order to prevent undue delay to the sailing of the steamer, was not found to be very satisfactory from the inspection point of view. Some of the fruit had to be loaded, after inspection, during night time, which was permitted, with the shippers' approval, as a temporary arrangement in the special circumstances. The shipment was not of very good quality. The cases were nice and clean and well nailed, a vast improvement on some previous shipments. Slings were used at first for loading, but the usual nets were substituted at the Inspector's request, and cases of overloading the nets were pointed out to the authorities. Some other instances of carelessness in handling the fruit was objected to and the matter put right. A cutter load of fruit from Sigatoka was included in this shipment, and the size and quality of this fruit indicated that no fear need be entertained as to the suitability of fruit from this district for export. The fruit was well stowed, air-holes and ventilation channels were plentiful, and the supply of dunnage was ample. Wind sails, however, were not in position in No. 1, No. 3 and No. 4 hatches when the ship was ready to sail, the authorities stated that these would be attended to by the crew immediately. A considerable quantity of fruit was carried on deck and 1,200 cases were shut out owing to want of space. The amount of fruit carried was 114 bunches and 16,827 cases, and rejections amounted to 4 per cent.

THE KAWAI.

By C. H. KNOWLES and R. KNIGHT.

This small yam is certainly worth the attention of anyone who has facilities for cultivating a small area of food plants. Being indigenous to Fiji, the natives have long recognised its value as a food, and it is cultivated in most, if not all, of the Fiji islands. It is cultivated in parts of India and Burmah. In the latter it is said to be found wild.

Seemann in *Flora Vitiensis* gives the following information about the plant:—

"The stem of this creeper is round and full of prickles, but it is not accommodated with reeds as that of the last-mentioned species (the common yam). It ripens about June—on the 27th of that month all the leaves were dead. It is propagated by planting the small tubers or roots, which, like the old ones, are oblong, of a brownish colour outside and a pure white within. When cooked, the skin falls off like the bark of a Birch tree, as Wilkes expresses it. The root is very farinaceous, and when well cooked looks like a fine mealy potato, although of superior whiteness. The taste recalls to mind that of the Aracacha of South America. There is a slight degree of sweetness about it which is very agreeable to the palate. Altogether the Kawai may be pronounced one of the finest esculent roots in the world and I strongly recommend its cultivation in these parts of the tropics still without it."

Climate and Soil.—The Kawai can be grown in districts too wet for the finer varieties of the yam and it is not attacked by the leaf fungus *gloeosporium pestis* which attacks yams and particularly the better varieties, and is very severe in wet years. Good land is necessary for a good crop and it must be well drained. The soil should not be too stiff, and if heavy clay soil is the only available kind, some means should be adopted for lightening it, such as the application of lime or coral sand.

Planting.—August and September are the best months to plant, the crop ripening the following June, July or August, depending apparently on the climatic conditions experienced during the growing period. The plant is propagated by the tuberous roots which sprout in the same manner as the potato.

Preparation of the land and cultivation.—The land must be well forked or ploughed to a depth of about 10 inches and then worked up into hills or ridges. Ploughing, cross-ploughing and harrowing was found to be satisfactory preparation of the land for this crop at Nasipu, together with the working necessary to form hills or ridges. The latter are easier to prepare by means of the plough. The land must be kept free from weeds, and care must be taken to avoid injury to the vines during weeding. The distances used at Nasinu were 4 feet by 4 feet. The vines need not be provided with stakes unless exposed to wind, in which case staking reduces the liability to damage. In sheltered situations there appears to be no

advantage to be derived by the use of stakes. Whole tubers are used for planting, and, as will be referred to subsequently, one tuber is sufficient for each place. The following information refers to three crops at Nasinu:—

	1916-1917.	1917-1918.	1918-1919.
Preparation of land ...	Ploughed, July, 1916..... Cross-ploughed Harrowed, August Hills formed, Sept.	Ploughed, July, 1916..... Cross-ploughed Harrowed Ridging, August	Ploughed, Sept., 1918. Cross-ploughed. Hills moulded by hand, 30th September.
Planting ..	September 29	September 1 and 3	October 2; 476 hills, one tuber used; 444 hills, two tubers used.
Number of weedings..	6 (two might have been omitted)	6 (vines staked on 2/3 plot. in November)	4.
Crop reaped	July 24, 1917	August 14 & 15, 1918	September 17, 1918.
Weight of crop & area	2,125 lb; .13 acre.....	5,792 lb; .27 acre.....	From one tuber, 2,777 lb; from two tubers, 2,489lb.
Equivalent rate/acre..	16,346 lb	21,455 lb175 acre, 15,870 lb; .163 acre, 15,270 lb.
Rainfall during crop	127.58 inches	127.25 inches	114.50 inches.
Notes	Crop reaped before vines had completely dried off; some loss sustained through pilfering in 64 hills.	Vines completely dry; no difference in staked and unstaked portions.	When two tubers were used the individual tubers produced were somewhat smaller than when only one was used.

Pests and diseases.—No insect pests or fungus diseases were found to damage the plant during any of these crops. In the case of the 1917-1918 crop when the crop was ripening and the leaves dying off, they became spotted, but as it occurred only at the end of the crop, and since that year gave the highest yield, it is not considered to be of any importance.

Storing.—The tubers must be carefully handled while being reaped and subsequently, as the outer skin is easily damaged while soft. The tubers will keep many weeks in a well-ventilated place, but they should be sorted over carefully while being stored so that any showing damage may be used first.

Cooking.—The Kawai can be either boiled or roasted, and, as with the potato, it is best not to remove the skin before cooking. The only preparation necessary is to clean them thoroughly.

A CO-OPERATIVE SUGAR FACTORY IN ANTIGUA, B.W.I.

The Antigua Sugar Factory Company has now completed the fifteen years covered by its agreement with the Government, and the chairman, Mr. G. Moody Stuart, has marked the occasion by giving a review of the history of this very noteworthy enterprise, which may be said to have been inspired by Sir Francis Watts, made possible by Sir Gerald Strickland, and carried out most efficiently by Mr. Moody Stuart. The value of the case lies not only in its local success but in the object lesson which it has given for other places. The short facts of the scheme were as follows:—

- (a) The Government provided £15,000 and the company £25,000, making a total of £40,000, for the erection of a factory to make 3,000 tons of sugar in the season. The factory was duly erected, the actual cost being £45,358, approximately £15 per ton of sugar capacity. It made its first crop in 1905. It has since grown to 10,000 tons sugar capacity, and the total cost to capital account has been £103,229, or £10 6s. per ton.
- (b) The Government stipulated for fair co-operative terms for the original contracting planters, and that, at the end of fifteen years, shares representing half the value of the factory should be made over to these. They have received high prices for their canes, the rate averaging in recent years over 9 per cent. on the f.o.b. price of sugar without any deduction for cost of bags or export taxes, the factory also bearing the cost of transport of canes from the estates. These terms are probably much in excess of what has been paid in any other part of the world, and these planters are now to have their shares, representing £51,615, transferred to them free of charge. This result has come not only from their being contracting planters, but also because of their being placed in the position of shareholders in respect of the £15,000 subscribed by the Government.
- (c) The Government also stipulated for fair rates for canes from peasant growers, and these have received about double the rates previously ruling. Now that the agreement with the Government under which they worked has terminated and there is no longer any charge on the company for interest and sinking fund for capital outlay, it is proposed to place them on a higher scale of payment for their canes.
- (d) The subscribers of the £25,000 have received for the whole period an average of 20 per cent. annually on their capital; they have had their capital repaid in full, and they hold shares representing half the value of the factory, or £51,615, and further they have approximately £18,000 standing at their credit in the company's books.
- (e) Another large section of the planting community has also profited by the factory, and the factory has profited by it—namely, the owners of plantations in the surrounding districts who have joined as new contractors. These have been paid on terms which have included sharing in half profits on each year's working account. The prices for their canes have compared favourably with prices paid elsewhere, their average in recent years being equal to over 7 per cent. on the f.o.b. price of sugar, the factory bearing all the charges mentioned above in paragraph (b).

The results are due, in the first place, to the sound basis on which the work was planned, and then to the improvement in the quality and the increase in the quantity of the work as the years went on. In its first three years the factory took 10 tons of cane to make one ton of sugar, which was just the rate calculated on in advance. Its work steadily improved, and during the last three years it has taken less than nine tons to the ton of sugar. In the first three years the output averaged 2,737 tons, in the last three years 9,586 tons. The improvement in the work gave over 10 per cent. more sugar costing nothing, and this, combined with more than trebling the quantity has changed a success into a great success.—(*The Colonial Journal*, April, 1920.)

SEA ISLAND COTTON.

Owing to the ravages of the boll weevil in the United States of America, the production of Sea Island cotton in that country has seriously declined; and the opinion of the United States Department of Agriculture, based on the very rapid decline in production during the past two years, is that Sea Island cotton may be doomed.

The *Weekly News Letter* issued by the Department says that, for the ten years ending 1916, the average annual production of Sea Island cotton was about 90,000 bales. The production in 1918 was only about 40,000 bales; and the estimates for 1919 were as low as 20,000 bales.

Without Sea Island cotton, many industries will be seriously crippled; if, indeed, they are not destroyed, and many planters will lose the major part of their income—unless some other variety of cotton of equally long staple and high quality and more nearly immuned from boll weevil attack is generally accepted and grown in the Sea Island districts of the South-eastern United States.

There is such a variety of cotton. It is known as Meade cotton, and was originated by the Bureau of Plant Industry, United States Department of Agriculture.

It is as fine as Sea Island cotton and as long. It can be handled on the regular Sea Island gins. It makes profitable yields under boll weevil conditions.

But, will the planters and ginnermen take sufficient interest and co-operate closely enough to ensure the continued production of an ample supply of pure Meade seed? Upon the answer to that question, in the opinion of the Department, depends the solution of the problem.

Of the 3,000 acres of Meade cotton growing this year, not more than 500 acres can be safely reported as pure stock. In order to keep it pure, no other variety of cotton must be planted in the same neighbourhood. The Department of Agriculture is encouraging communities of farmers to organise for the purpose of growing only the Meade cotton and of keeping up the standard by continued selection and careful ginning.—(*The Colonial Journal*, April, 1920.)

The Sea Island cotton plant is suitable for cultivation in only a limited portion of the Empire. Originally cultivated in the West Indies, seed was taken to the United States of America, where the plant has been brought to its present state of perfection. The places where the cultivation of this cotton has been most extensive are small islands off the coast of Georgia and South Carolina, hence the name Sea Island cotton.

The plant grows well in the dryer parts of the Fiji group. During the existence of the Lautoka Experimental Station, Sea Island cotton was the chief crop. The following information shows the results obtained:—

Year.	Area.	Seed cotton.	Lint.	Per cent. of lint.	Yield of lint per acre.
	Acres.	lb.	lb.		lb.
1906-07 ..	7.96	7,593.25	2,146.5	28.3	269.6
1907-08 ..	19.70	10,469.75	3,034.5	29.0	154.0*
1908-09 ..	14.80	3,835.0	1,181.3	31.0	79.0†
1909-10 ..	15.00	3,113	895.0	28.8	59.5‡
1910-11 ..	15.80	5,804	1,613.75	27.8	102.2§
1911-12 ..	7.50	4,129	1,130	26.9	150.7
1912-13 ..	7.73	4,635	1,359.75	29.3	176.0
1913-14 ..	8.70	8,454	2,377	28.1	273.6
1914-15 ..	9.40	8,242	2,245	27.2	238.8
....	106.59	56,275	15,982.8	28.4	150

* Bushes partly uprooted by storm in March.

† Planting delayed. Unfavourable weather caused bushes to be stunted.

‡ Plants partly uprooted by storm in March.

§ Area included shallow soil on hillside, where average yield was only 43.4 lb per acre. The alluvial flat land gave 170.6 lb per acre.

The average yield per acre of the whole period (150 lb) is considerably lowered owing to the experiments made with some of the areas. Thus in 1908-09 planting was delayed, so that by March the bushes were quite small and would be less liable to injury by a storm. The subsequent weather was not favourable for the proper growth of the plants, hence early planting was followed in all subsequent years. In 1907-08 and 1909-10 storms partially uprooted the bushes. This is a risk that must be taken. During ten years, damage to an appreciable extent was experienced twice. In 1910-11, cotton planting was tried on the hillside, where the soil is poor, but rather thin and lying on a rock of a sandy nature. Such land does not retain moisture and unless the weather is very favourable, the plants suffer from lack of moisture. Red soil was found to be unsuitable for cotton.

The best land is black alluvial soil, well drained; planting should be made in December-January, at distances of 2½ ft., in rows 5 ft. apart, several seeds being planted at each place, to be gradually thinned to one plant. Cultural operations are confined to keeping the land weeded, care being taken to return any soil removed from around the bases of the plants.

The crop should be from 180-200 lb of lint. Picking is an operation needing the greatest care. Owing to its long fibre, Sea Island cotton cannot be passed without injury through the machines to clean it of bits of leaf, &c., such as is done with short staple cotton, hence the cotton must be picked quite clean and free from trash before ginning.

When reaped the cotton is in the form of threads adhering to a number of seeds, and these latter must be removed by a process known as "ginning," after which the lint is baled for export, care being taken that too much pressure is not used.

COPRA IMPROVEMENT IN THE ISLAND OF GUAM.

The following information and suggestions relating to the improvement in the manufacture of copra, taken from an Order dated 29th December, 1919, made by the Governor of the Island of Guam, will be of interest to copra producers. While there may be nothing new in the suggestions, the Order places important information before coconut planters in a very concise form and this information together with the suggestions are well worth careful attention.

"It has been found after experimenting that one hundred (100) pounds of meat of ripe coconuts will produce about sixty-five (65) pounds of first class copra when properly dried, for which the producer should receive at least three (3c.) cents a pound (about 8 cents at present), making the value one dollar and ninety-five (\$1.95) cents.

"The same weight of coconut meat taken from unripe nuts will produce about fifty (50) pounds of poor quality of copra worth about two (2c.) cents a pound, making the value about one (\$1.00) dollar or about half the value of well dried copra made from ripe nuts. So much poor quality of copra has been produced in Guam that the copra made here has a poor reputation in the outside market.

"Coconuts in the husk may be stored for months if kept clear of the ground and dry. Coconuts thus stored are better for copra than coconuts when they first fall from the trees.

"The real gauge of the value of copra is its condition upon arrival at destination. Most of the copra from Guam goes to San Francisco and has to be in the hold of a schooner for fifty (50) to sixty (60) days. None but first class copra can stand such a trip without undue deterioration.

"The deterioration in copra is caused chiefly by containing too much water, due to not being properly dried; being made from unripe nuts, when the copra contains too much free fatty acid; or by getting wet during the curing. Any of these conditions cause rapid deterioration of copra when stored in bulk. Even a small amount of poor copra mixed with good copra will cause rapid deterioration in the whole cargo.

"The shrinkage in Guam copra after purchase has heretofore averaged about fifteen (15%) per cent. It should be in the neighbourhood of five (5%) per cent.

"The following instructions are issued in regard to making copra:—

- "1. None but ripe nuts should be used.
- "2. All copra should be well dried before being stored or shipped.
- "3. Copra dries more quickly and uniformly if cut in strips not more than one and one-half ($1\frac{1}{2}$) inches wide.
- "4. After April 1, 1920, every copra producer should have a drying shed suitable to his needs. Community sheds for small producers are recommended. All copra should be dried on ventilated frames well clear of the ground and must be protected from rain, salt water and dirt.
- "5. A copra inspector will be appointed who will be authorised to inspect copra wherever found at any time, and who will inspect all copra before exportation.
- "6. On and after January 1, 1920, it will be unlawful to export any but first class copra which is defined as copra made from ripe nuts, well dried, brittle and free from dirt and other foreign matter and which is not rancid, badly moulded or badly discoloured. In case of a typhoon or other disaster special instruction will be issued.
- "7. The penalty for exportation of any but first class copra, except by special permit, will be a fine not to exceed one thousand (\$1,000.00) dollars.

A METHOD OF ERADICATING JOHNSON GRASS.

The *Farmers' Bulletin* No. 279 of the United States Department of Agriculture is devoted to a method of eradicating this pest of cultivated land, and as it is a bad weed in parts of Fiji the following extracts may be of interest:—

Part III of *Bulletin* No. 72 of the Bureau of Plant Industry is quoted as containing the results obtained in certain experiments carried out with the object of devising methods of eradicating Johnson grass. Several of the methods were entirely successful, and cotton has since been grown on the land operated upon practically free from Johnson grass. It was felt, however, that it was necessary that a careful study should be made of the root-stock habits of the plant in all soils and under all conditions and the *Farmers' Bulletin* No. 279 describes the results of this study which has been made since the *Bulletin* No. 72 was issued.

The method in the first experiments which gave the best results was to plough the land in the Autumn and then by means of some such implement as a grass-hoe, to remove the root-stocks from the soil. The land was treated twice with this implement and it was estimated that the root-stocks removed from each acre weighed a ton. On most of the land no further special treatment was given. Part of it was summer-fallowed the next summer and on this part every sprig of Johnson grass was killed. On the remainder of the land a few sprigs of the grass grew the next year, but they were so few that even three years later the grass was not troublesome. In the study of the root-stock habits of the plant, it is mentioned that the underground stems, or root-stocks, are the source of most of the trouble. These root-stocks are classed as primary, secondary, and tertiary.

Primary root-stocks embrace all the root-stocks alive in the ground at the beginning of the growing season; secondary ones are those which arise from the primaries, come to the surface and there form crowns, thus providing new plants; a tertiary root-stock is one starting later in the season, about flowering time, from the base of the crown of the new plant and grows down into the soil. The tertiary root-stocks, when the ground is soft and especially when a large top is allowed to develop, grow to a large diameter and penetrate to a great depth, sometimes as much as 4 feet, and normally from 15 to 20 inches. When the soil is compact, and especially when the plant above the ground is not allowed to develop, these tertiary root-stocks grow to but small diameter and run along just under the surface, cropping out at intervals to form new plants.

The observations of the writers of the *Bulletin* indicate that primary root-stocks all decay after the growing season is over. Their strength has been taken up in the formation of secondary root-stocks and above-ground growth. Secondary root-stocks are usually no larger in diameter than the primaries from which they spring, and their length is determined by the depth at which the primaries are buried. Secondary root-stocks can send out others at their joints. These branches of the secondaries are directed, like the parent stem, toward the surface. The secondaries and tertiaries become primaries at the beginning of the following growing season, when they in their turn send out secondary growth to reach the surface, the plant formed at the surface then sends down from the base of its crown, about the time it blossoms, large, deep-burrowing tertiary root-stocks, which in soft land, such as cultivated cotton and corn fields, cause much mischief the following year. *The longer the plants are allowed to stand after blossoming, the larger and deeper these tertiary stems become.*

Owing to the deep root-stocks containing a large amount of nutriment, they can, after they have once been allowed to form, even though the surface plants be kept closely cut by cultivation, continue to send up fresh growth for some time.

Various illustrations are given in the *Bulletin* of the different types of root-stock development met with. The method of eradication based on root-stock habits, with old Johnson grass, is to break up the land very shallow. Comparing shallow and deep ploughing, it is pointed out that in the case of root-stocks buried deeply a large part of their substance is turned into secondaries to connect with the new surface plant, while in the case of shallow ploughing there is no opportunity for the plant to form a long secondary, only a small part goes into this secondary growth, the main substance of the root-stock going directly into the part of the plant above the ground. As the growth above the ground is easily killed, while the secondary growth is as troublesome as the primary root-stocks, it is clear that the proper method is to break up the soil only to a shallow depth and attempt to keep the root-stocks as near the surface as possible. This must be carefully done and it is better to re-plough the soil to stimulate growth from the primary root-stocks, which soon tend to become exhausted. It is of course of great importance that close cultivation be given at the same time to destroy the young plant before it starts the formation of tertiary root-stocks, which form about flowering time, otherwise the whole benefit from previous work is lost.

The *Bulletin* states that no patented chemical or other preparation for destroying Johnson grass which has been examined has been found to be practical or economical in any way.

The summary in the *Bulletin* is to the following effect:—

A logical method of controlling Johnson grass in the light of root-stock investigations seems to be, in brief, to turn the land into meadow or pasture and keep the grass closely cropped either by grazing animals upon it or by mowing it for one or more seasons. Since the development of the tertiary growth becomes quite vigorous about the time the plant begins to blossom, it is a matter of the utmost importance not to allow the grass to stand after blossoming time. After the soil has remained undisturbed for a year it should be ploughed shallow and subsequent cultivation should be intelligently and efficiently done.

It must be remembered that the above notes apply to the plant in the United States where there is a regular summer and winter. In the tropics, where the distinction between the seasons is not so well marked, the particular stages of the development of the underground system of the plant may not be so clearly separated. However, since there is a regular flowering season for the grass, even though it covers a longer period of time than in America, the main principles of the method would appear to be quite applicable to land infested with the weed in the tropics.

ARTIFICIALLY-DRIED COPRA FROM TAVEUNI.

A sample of copra has been received from Taveuni from Mr. W. G. MacKay which has been prepared in a hot-air dryer built to take 12-bags of green copra weighing 2,000 lb, the time allowed for drying being 20 hours.

The general design of the dryer was obtained from the small one at the Nasinu Station and improved in one or two respects.

The dryer is said to be very light on fuel, the husks of only half the nuts forming the charge being necessary to prepare the copra.

The copra was quite clean in appearance and on examination at the chemical laboratory it was found to contain 6.21 per cent. of moisture, an amount sufficiently low to enable the copra to be described as good.

DEPARTMENTAL NOTES.

Lieut.-Col. Rainey, C.B.E., Government Veterinary Officer is investigating stock matters in the Sigatoka district, on the completion of which he will proceed to Navua.

Mr. H. V. G. Rivington was appointed Inspector of Plantations, Second Grade, on 17th May, and to be an Inspector under the Diseases of Plants Ordinance and under the Noogoora Burr Ordinance. Mr. Rivington proceeded to the Ba district to inspect for Noogoora Burr on 26th May.

Mr. M. A. Forsyth was promoted to be First Grade Inspector of Plantations on 1st May, 1920.

Mr. W. Clifford was appointed temporary Inspector of Plantations, Third Grade on 1st May.

Mr. W. A. Niven has been appointed temporarily manager of the Navuso Estate.

INSPECTION OF VESSELS.

The following shows the number of vessels inspected during the month of April, 1920, under the Diseases of Plants Ordinance 1913 Regulations, and the number of cases in which material was destroyed:—

Port.	No. of vessels inspected.			Cases in which material was destroyed.	
Suva	10	—
Levuka	61	22
Lautoka	9	1

The master of a cutter was proceeded against at Levuka for failing to observe the regulations relating to the sailing of vessels from a place where scale exists for other parts of the group, and was fined £2.

Agricultural Associations in Fiji.

THE COUNCIL OF PLANTERS OF FIJI.

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Vice-ChairmanMR. E. DUNCAN.

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THE CAKAUDROVE COPRA GROWERS' ASSOCIATION.

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THE LABASA PLANTERS' ASSOCIATION.

THE SAVUSAVU PLANTERS' ASSOCIATION.

THE SOUTHERN DISTRICTS PLANTERS' ASSOCIATION.

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